

What is claimed is:

- 5                   1. An acidic composition having an acidic pH value and an acid normality value, the acidic composition comprising:
- a monovalent or polyvalent cation;  
                  an organic acid; and  
                  an anion of a strong oxyacid,  
                  wherein the acidic composition is less  
10               corrosive to a ferrous metal than is a solution of a mineral acid having the same acidic pH value as that of the acidic composition, and  
                  wherein the acid composition is more biocidal  
                  than a mixture of the organic acid and a metal salt of  
15               the organic acid which mixture having the same acid normality value as that of the acidic composition.
2. The acidic composition of claim 1, wherein the monovalent cation comprises an ion of Group IA element.
3. The acidic composition of claim 1, wherein  
20               the polyvalent cation comprises an ion of a Group IIA element, but not beryllium.
4. The acidic composition of claim 1, wherein the polyvalent cation comprises an ion of a Group IIIA element, but not boron.
- 25               5. The acidic composition of claim 1, wherein the polyvalent cation comprises a metal of the first transition series. → over Zn
6. The acidic composition of claim 1, wherein

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the polyvalent cation comprises an ion of magnesium, calcium, ferrous, copper, or zinc.

7. The acidic composition of claim 1, wherein the polyvalent cation comprises an ion of lead,  
5 bismuth, or tin.

8. The acidic composition of claim 1, wherein the organic acid comprises a carboxylic acid or an acidic vitamin.

9. The acidic composition of claim 8, wherein  
10 the acidic vitamin comprises vitamin C.

10. The acidic composition of claim 1, wherein the organic acid comprises a monocarboxylic acid, a dicarboxylic acid, or a tricarboxylic acid.

11. The acidic composition of claim 1, wherein  
15 the organic acid comprises acetic acid, lactic acid, formic acid, or propionic acid.

12. The acidic composition of claim 1, wherein the organic acid comprises an amino acid.

13. The acidic composition of claim 12, wherein  
20 the organic acid comprises glycine, valine, leucine, phenylalanine, lysine, serine, asparagine, glutamic acid, alanine, arginine, aspartic acid, cysteine, histidine, hydroxylysine, hydroxyproline, isoleucine, methionine, proline, threonine, tryptophan, tyrosine,  
25 aminoadipic acid, diaminobutyric, ornithine, pepicollic acid, sarcosine or triiodothyronine.

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14. An acidic composition prepared by mixing ingredients comprising:

- 5       at least one regenerating acid having a first number of equivalents;  
      at least one metal base having a second number of equivalents; and  
      at least one organic acid,  
10       wherein the first number of equivalents of the regenerating acid is greater than that of the second number of equivalents of the metal base.

15       15. The acidic composition of claim 14, wherein the regenerating acid comprises a strong oxyacid of sulfur, phosphorus, nitrogen, chromium, or iodine.

16. The acidic composition of claim 14, wherein the regenerating acid comprises a strong oxyacid of molybdenum, tungsten, or selenium.

17. The acidic composition of claim 14, wherein the regenerating acid comprises sulfuric acid, phosphoric acid, or an acidic solution of sparingly-soluble Group IIA complexes.

18. The acidic composition of claim 17, wherein the acidic sparingly-soluble Group IIA complex is prepared by mixing ingredients comprising a mineral acid and a Group IIA hydroxide, or a Group IIA salt of a dibasic acid, or a mixture thereof.

19. The acidic composition of claim 18, wherein the Group IIA hydroxide comprises calcium hydroxide,

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the mineral acid comprises sulfuric acid, and the Group IIA salt of the dibasic acid comprises calcium sulfate.

20. The acidic composition of claim 14, wherein the metal base comprises a hydroxide, a carbonate, a bicarbonate, or an oxide of a metal.

21. The acidic composition of claim 14, wherein the metal base comprises a base of a Group IA element.

22. The acidic composition of claim 14, wherein the metal base comprises a base of a Group IIA element, but not beryllium.

23. The acidic composition of claim 14, wherein the metal base comprises a base of a Group IIIA element, but not boron.

24. The acidic composition of claim 14, wherein the metal base comprises a base of a metal of the first transition series.

25. The acidic composition of claim 14, wherein the metal base comprises a base of magnesium, calcium, ferrous, copper, or zinc.

26. The acidic composition of claim 14, wherein the metal base comprises a base of lead, bismuth, or tin.

27. The acidic composition of claim 14, wherein the organic acid comprises a carboxylic acid or an acidic vitamin.

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28. The acidic composition of claim 27, wherein the acidic vitamin comprises vitamin C.

29. The acidic composition of claim 14, wherein the organic acid comprises a monocarboxylic acid, a  
5 dicarboxylic acid, or a tricarboxylic acid.

30. The acidic composition of claim 14, wherein the organic acid comprises acetic acid, lactic acid, formic acid, or propionic acid.

31. The acidic composition of claim 14, wherein  
10 the organic acid comprises an amino acid having an amino group, and wherein the number of equivalents of the regenerating acid is greater than the total number of equivalents of the metal base and the amino group of the amino acid.

15 32. The acidic composition of claim 31, wherein the organic acid comprises glycine, valine, leucine, phenylalanine, lysine, serine, asparagine, glutamic acid, alanine, arginine, aspartic acid, cysteine, histidine, hydroxylysine, hydroxyproline, isoleucine,  
20 methionine, proline, threonine, tryptophan, tyrosine, aminoadipic acid, diaminobutyric, ornithine, pepicollic acid, sarcosine or triiodothyronine.

33. An acidic composition prepared by mixing  
25 ingredients comprising:

at least one regenerating acid having a first number of equivalents; and

at least one metal salt of an organic acid having a second number of equivalents,

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wherein the first number of equivalents of the regenerating acid is greater than the second number of equivalents of the metal salt of the organic acid.

34. The acidic composition of claim 33, wherein  
5 the regenerating acid comprises a strong oxyacid of sulfur, phosphorus, nitrogen, chromium, or iodine.

35. The acidic composition of claim 33, wherein the regenerating acid comprises a strong oxyacid of molybdenum, tungsten, or selenium.

10 36. The acidic composition of claim 33, wherein the regenerating acid comprises sulfuric acid, phosphoric acid, or an acidic solution of sparingly-soluble Group IIA complexes.

15 37. The acidic composition of claim 36, wherein the acidic sparingly-soluble Group IIA complex is prepared by mixing ingredients comprising a mineral acid and a Group IIA hydroxide, or a Group IIA salt of a dibasic acid, or a mixture thereof.

20 38. The acidic composition of claim 36, wherein the Group IIA hydroxide comprises calcium hydroxide, the mineral acid comprises sulfuric acid, and the Group IIA salt of the dibasic acid comprises calcium sulfate.

25 39. The acidic composition of claim 36, wherein the metal salt of the organic acid comprises a salt of a Group IA element.

40. The acidic composition of claim 36, wherein

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the metal salt of the organic acid comprises a salt of a Group IIA element, but not beryllium.

41. The acidic composition of claim 36, wherein the metal salt of the organic acid comprises a salt of a Group IIIA element, but not boron.

42. The acidic composition of claim 36, wherein the metal salt of the organic acid comprises a salt of a metal of the first transition series.

43. The acidic composition of claim 36, wherein the metal salt of the organic acid comprises a salt of magnesium, calcium, ferrous, copper, or zinc.

44. The acidic composition of claim 36, wherein the metal salt of the organic acid comprises a salt of lead, bismuth, or tin.

45. The acidic composition of claim 36, wherein the organic acid comprises a carboxylic acid or an acidic vitamin.

46. The acidic composition of claim 36, wherein the acidic vitamin comprises vitamin C.

47. The acidic composition of claim 36, wherein the organic acid comprises a monocarboxylic acid, a dicarboxylic acid, or a tricarboxylic acid.

48. The acidic composition of claim 36, wherein the organic acid comprises acetic acid, lactic acid, formic acid, or propionic acid.

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49. The acidic composition of claim 36, wherein the organic acid comprises an amino acid having an amino group, wherein the total number of equivalents of the regenerating acid is greater than the total number of equivalents of the metal salt of the organic acid and the total number of equivalents of amino groups from the amino acid.

50. The acidic composition of claim 49, wherein the organic acid comprises glycine, valine, leucine, phenylalanine, lysine, serine, asparagine, glutamic acid, alanine, arginine, aspartic acid, cysteine, histidine, hydroxylysine, hydroxyproline, isoleucine, methionine, proline, threonine, tryptophan, tyrosine, aminoadipic acid, diaminobutyric, ornithine, pepicollic acid, sarcosine or triiodothyronine.

51. An acidic composition prepared by mixing ingredients comprising:

at least one regenerating acid, wherein the regenerating acid comprises sulfuric acid, phosphoric acid or an acidic solution of sparingly-soluble Group IIA complexes, and wherein the regenerating acid has a first number of equivalents;

at least one polyvalent base, wherein the polyvalent base is calcium hydroxide, calcium carbonate, or magnesium hydroxide, and wherein the polyvalent base has a second number of equivalents; and

at least one organic acid, wherein the organic acid is acetic acid, lactic acid, formic acid or propionic acid, and

wherein the first number of equivalents of the regenerating acid is greater than the second number

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of equivalents of the polyvalent base.

52. The acidic composition of claim 51, wherein the acidic sparingly-soluble Group IIA complex is prepared by mixing ingredients comprising a mineral  
5 acid and a Group IIA hydroxide, or a Group IIA salt of a dibasic acid, or a mixture thereof.

53. The acidic composition of claim 52, wherein the Group IIA hydroxide comprises calcium hydroxide, the mineral acid comprises sulfuric acid, and the Group  
10 IIA salt of the dibasic acid comprises calcium sulfate.

54. An acidic composition prepared by mixing ingredients comprising:

at least one regenerating acid, wherein the regenerating acid comprises sulfuric acid, phosphoric  
15 acid or an acidic solution of sparingly-soluble Group IIA complexes, and wherein the regenerating acid has a first number of equivalents;

at least one salt of an organic acid, wherein the salt is a calcium or magnesium salt of acetic acid, lactic acid, formic acid or propionic acid, and  
20 wherein the salt of the organic acid has a second number of equivalents, and

wherein the first number of equivalents of the regenerating acid is greater than the second number  
25 of equivalents of the salt or the organic acid.

55. The acidic composition of claim 54, wherein the acidic sparingly-soluble Group IIA complex is prepared by mixing ingredients comprising a mineral  
30 acid and a Group IIA hydroxide, or a Group IIA salt of

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a dibasic acid, or a mixture thereof.

56. The acidic composition of claim 55, wherein the Group IIA hydroxide comprises calcium hydroxide, the mineral acid comprises sulfuric acid, and the Group IIA salt of the dibasic acid comprises calcium sulfate.

57. A method of preparing an acidic composition, comprising:

dissolving or suspending an organic acid in water to give a solution or suspension of the organic acid;

adding a metal base to this solution or suspension of the organic acid to give a mixture;

adding to the mixture an amount of regenerating acid sufficient to ensure complete regeneration of the organic acid from its metal salt; and

removing the undissolved solid to give the acidic composition.

58. A method of preparing an acidic composition, comprising:

dissolving or suspending a monovalent, divalent or trivalent metal salt of an organic acid to give a solution or suspension of the salt of the organic acid;

adding to the solution or suspension of the salt of the organic acid an amount of regenerating acid sufficient to ensure complete regeneration of the organic from its metal salt; and

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removing the undissolved solid to give the  
acidic composition.

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